PATENT SPECIFICATION

593,531

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COMPLETE SPECIFICATION

Improvements in and relating to the Moulding of Plastic Materials

I, FRANK ERNEST WALL, a British subject, of 66, Foyle Road, Blackheath, London, S.E.3, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the production of composite plastic mouldings, that is, mouldings composed of two or more masses or layers of material moulded in successive stages, the masses being intimately united to form a single moulded article. The invention is particularly concerned with the production of plastics of the phenolic and urea groups, but is neither limited to production of mouldings in these materials, nor to the production of composite mouldings by means successive moulding stages carried out as a continued operation in a single mould, although in practice a continued operation would in most cases be employed. Further, the invention has especial reference to the production of small mouldings, such as bottle caps, buttons, umbrella knobs, control knobs for radio and other instrument dials, drawer handles, jewellery and other articles of utility, but again it is to be understood that the invention is not limited to small mouldings of these kinds.

The production of composite mouldings has hitherto been impeded by the existence of a problem which as yet has found no satisfactory solution, the problem being that of preventing material in a succeeding moulding stage entering the gap which forms between a preceding mass and its moulding cavity when the mass already moulded contracts on setting. This shrinkage gap may be of very small dimensions amounting possibly to no more than a thousandth of an inch or so, but this is nevertheless sufficient to permit the entrance, extruded through the mouth thereof, of material employed in a succeeding moulding stage which spreads raggedly over the surface of the contracted set mass already moulded forming a disfiguring sprue.

It is the main object of the present invention to obviate this defect and to ensure that sharply defined boundaries are obtained between masses moulded in successive stages to produce a composite moulding.

With the above object in view the invention provides a method of producing composite plastic mouldings with sharply defined boundaries between masses moulded in successive stages, which includes the step of sealing the gap which is normally formed between a moulded mass and its moulding cavity when said mass contracts on setting, so as to prevent entrance into said gap of material employed during the succeeding moulding stage. This sealing may be effected by positioning a loose diaphragm element so as to extend beyond the outline of an already moulded mass to cover the gap due to contraction of this preceding mass. The interposed diaphragm is of such a nature or character as to be capable of uniting with the two masses between which it is sandwiched so as to form part of the composite moulding. Alternatively or additionally a controlled flash may be formed at the boundary face of one mass to constitute a barrier preventing entrance of material employed during the succeeding moulding stage into the contraction gap around the previously moulded mass. The surplus diaphragm material or the intentionally formed barrier flash is subsequently removed.

In order that the invention may be more readily understood the two modes of sealing the contraction gap as previously referred to will now be described with the aid of the accompanying drawings, which, by way of example, illustrate the application of the invention to the production of a bottle cap. Figure 1 is for explanatory use only and shows the defect experienced hitherto and which the present invention eliminates. Figures 2 and 3 illustrate diagrammatically the first and second moulding stages in the production of a composite bottle cap in which the top sur-

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face of the cap body is overlaid with a crown layer of another material; these figures relate to the mode of sealing outlined above in which a controlled flash is intentionally produced. Figure 4 illustrates, as described in detail later, the other mode of sealing proposed, namely, that of using a loose diaphragm element which unites with the successively moulded masses. Figure 5 shows the composite moulding with part of the flash (or surplus diaphragm material) removed.

Figure 1 of the drawing shows simply how the appearance of the moulding is marred by reason of the sprue of material of the crown layer A spreading raggedly over the surface of the body mass B.

Figure 2 shows the first operation in the production of the example, that is, a bottle cap, in which following known moulding technique a bottle cap body 1 is produced in the bottom force 3 of a semi-positive type mould, the female thread in the cap interior being fashioned by means of the shaped stem of an ejector element 2. At the entrance to the primary mould cavity 4 a rebate or gutter 5 is formed which results in the formation of a controlled flash 6 when the flat bottomed top force 7 is lowered into the secondary mould cavity 8. Before ejecting the moulded body 1 the substance which is to constitute the crown layer of the bottle cap is introduced into the secondary cavity 8 above the moulded body 1 in suitable form, such as a pellet, and the second operation is carried out as shown in Figure 3. The top force 9 used in this operation has a concavity 10 in its underface which forms a domed crown layer 11, the normal flash 12 from the second operation overlaying the controlled flash 6 of the first operation. The rebate 5 ensures a complete flash annulus, and the flash 6 intentionally formed thereby is sufficiently thick to serve as a barrier preventing any of the normal crown layer flash 12 passing down into the shrinkage gap existing between the set body 1 and its moulding cavity 4. The flash ordinarily formed is thin and indeterminate, sometimes only incompletely extending around the top edge of the body 1; in the foregoing embodiment of the invention is purposely designed and formed to serve the purpose stated and in that sense is described herein as a controlled flash.

In the alternative mode of sealing illustrated in Figure 4 a loose diaphragm element in the form of a disc 13 of fabric, paper, sheet plastic or other suitable material, is positioned in the bottom of the secondary cavity 8 above the body 1 already moulded in the primary cavity 4. The disc 13 extends a suitable amount beyond the outline of the body 1. The crown layer is then applied by a second operation as already described, the disc 13 interposed between the body 1 and the crown layer 11 uniting with the two successively moulded masses to form part of the composite moulding. It will be readily apparent that the disc sealing method may be used together with the controlled flash method, if desired. The unwanted material, whether surplus diaphragm material or flash is removed or trimmed in known manner, giving the desired result as indicated at the right hand portion of Figure 5.

The invention has been described as applied to compression moulding procedure, but the application of the invention to other forms of moulding and the repetition of the sealing to produce stratified mouldings consisting of more than two layers of material will be readily appreciated by those skilled in the art of moulding plastics.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A method of producing composite plastic mouldings with sharply defined boundaries between masses moulded in successive stages, which includes the step of sealing the gap which is normally formed between a moulded mass and its moulding cavity when said mass contracts on setting, so as to prevent entrance into said gap of material employed during the succeeding moulding stage.

2. A method of producing composite plastic mouldings with sharply defined boundaries between masses moulded in successive stages, which includes the step of positioning a loose diaphragm element so as to extend beyond the outline of a moulded mass to cover the gap which is normally formed between the mass and its moulding cavity when said mass contracts on setting, said diaphragm constituting a barrier preventing entrance into said gap of material employed during the succeeding moulding stage and uniting with the two masses to form part of the composite moulding, surplus diaphragm material being subsequently removed.

3. A method of producing composite plastic mouldings with sharply defined boundaries between masses moulded in successive stages, which includes the step of forming a controlled flash at the boundary face of one mass to constitute a barrier preventing entrance into the gap formed between the moulded mass and its moulding cavity when said mass contracts on setting of material employed during

the succeeding moulding stage, the flash being subsequently trimmed from the composite moulding.

4. A method as claimed in claims 2 and 3 in which both modes of sealing the contraction gap are employed in the same moulding sequence.

5. Composite mouldings when produced according to any of the methods hereinbefore claimed.

Dated this 1st day of June, 1945.

EDWIN C. AXE, A.I.M.E.,
27, Chancery Lane, London, W.C.2,
Agent for the Applicant.

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Fig.1.

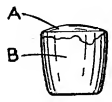


Fig.2.

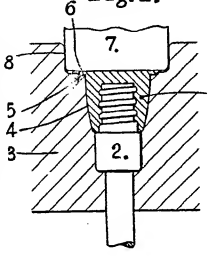


Fig.4.

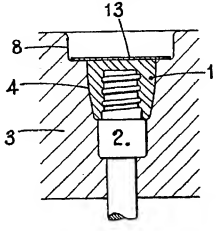


Fig.3.

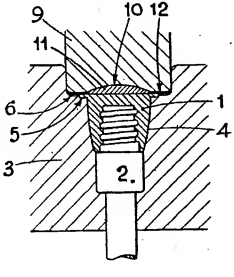
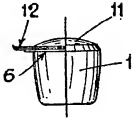


Fig.5.



H.M.S.O. (ty.p.)